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Information Retrieval Capabilities-National Environmental Research Center, Cincinnati, Library

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Information Retrieval Capabilities-National Environmental Research Center, Cincinnati, Library

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Information Retrieval Capabilities- National Environmental Research Center, Cincinnati, Library

M. Friedman
National Environmental Research Center
Cincinnati, Ohio 45268

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NATIONAL ENVIRONMENTAL RESEARCH CENTER
OFFICE OF RESEARCH AND MONITORING
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

PREFACE

The library at the National Environmental Research Center, Cincinnati, is the scientific and technical information focal point for the entire Environmental Protection Agency Library system. As such, it provides technical information back-up to all other EPA libraries, in addition to its responsibilities to NERC-Cincinnati.

The Cincinnati Library has access to a number of information centers which maintain over 25 scientific and technical computerized data bases, and contains over 2.5 million documents. We are now providing literature searches with our Datapoint 3300 CRT computer terminals, using a variety of on-line and off-line data base services. These services allow the library to provide retrospective searches on demand as well as current awareness programs tailored to the individual's requirements.

This manual describes these information services in more detail. Most of the services discussed herein are now available for usage. Some others will be installed and operational in a few months.

Future developments in our information retrieval activities will be designed to enhance the depth and breadth of coverage and the variety of services provided to EPA staff members requiring access to scientific and technical publications.

ACKNOWLEDGEMENTS

We acknowledge with appreciation the permission of the University of Georgia to use the sections on weighting and logic, some of which is based on the material found in "Profile Coding and Management Manual for the University of Georgia Text Search System".

Preparation of the document has been aided by the significant assistance provided by the entire staff of the NERC-Cincinnati Library, in particular, Maxine M. Smith, Dottie F. Brofft, and Mary L. Calkins.

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U. S. ENVIRONMENTAL PROTECTION AGENCY

NERC - CINCINNATI LIBRARY

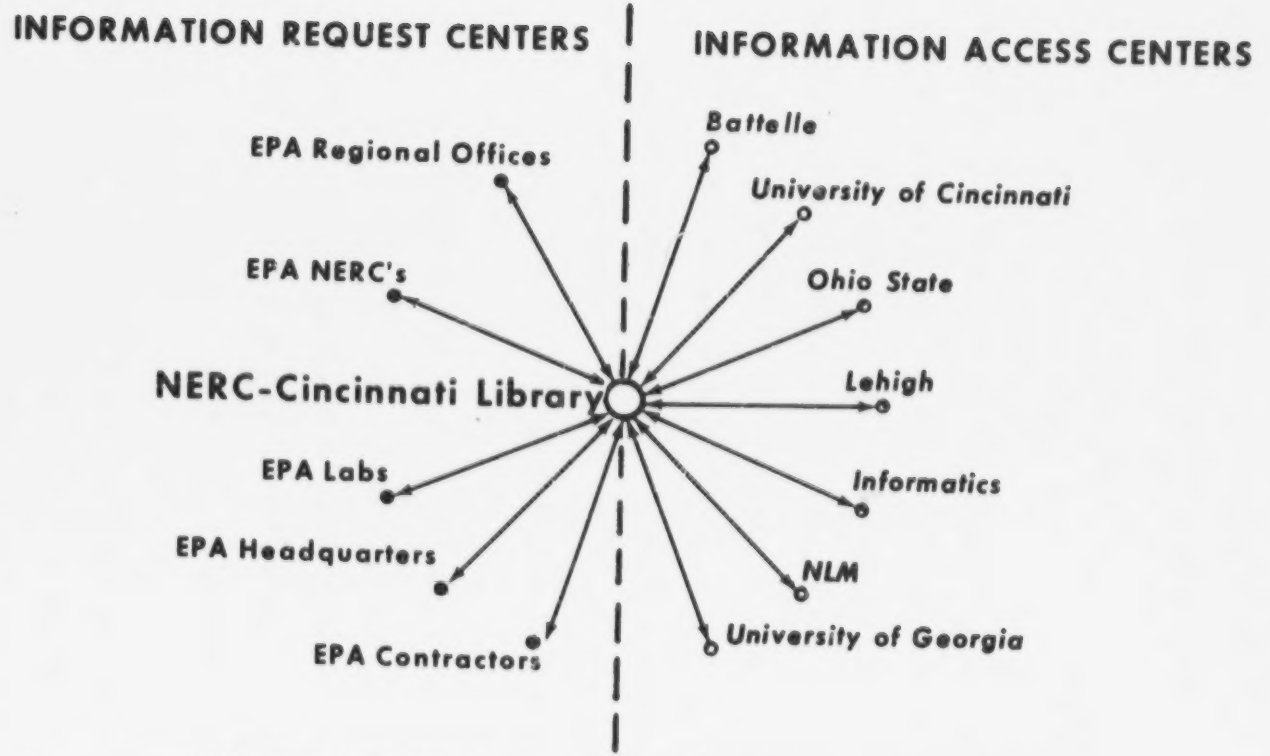
MANUAL ON COMPUTER SEARCHES

I. INTRODUCTION

The traditional library resources of EPA have been augmented by access to various data bases for computer searching of the literature. With the ever-increasing amounts of published literature, it is necessary to have a more efficient means of access and comprehensive coverage of these sources of information. Computers capable of rapid screening of material answer this need and provide a necessary supplement to library services. The concept of an EPA Information Network was developed and expanded as exemplified in Figure 1.

This manual is designed mainly for use by librarians in understanding computerized searching, and discusses only currently available or soon-to-be-implemented data bases. Procedures described herein will be applicable to all present and future accessible data bases.

The data bases which the EPA library can or soon will be able to access are located at the University of Cincinnati, Bio-Sciences Information Service (Biological Abstracts), Battelle Memorial Institute (AMIC), Lehigh University (Leadermart), National Library of Medicine (MEDLINE), Informatics Inc. (Toxicon and Environ), Ohio State University and the University of Georgia. These information centers and their systems are described in more detail later in the manual.



NERC-CINCINNATI INFORMATION NETWORK

FIGURE 1

The University of Georgia has the most data bases, and is usually accessed for retrospective searches. Lehigh University, Battelle Memorial Institute, and National Library of Medicine are searched on-line from NERC-Cincinnati to their respective computers. The computer terminals for these are located in the EPA Library, Columbia Parkway, Cincinnati. Access to the terminal is available by telephoning the EPA Library, using Commercial or FTS lines (513/871-1820, ext. 492, 493, or 494), by Xerox telecopier (automatic) (513/871-1820, ext. 249), by TWX (810/461-2796), or by mail addressed to the library. Forms have been provided in order for the librarian to clearly state the search strategy and selected terms. These forms should always be completed according to the instructions provided and sent to the library. Telephone conversation should be limited to supplementing the information on these forms or for unusual situations.

The NERC Library will supply hard copy or microfiche for retrieved references if the requesting library cannot obtain them locally.

Appendix A. contains a brief overview of the major data bases and a listing of the subject areas each data base covers. This appendix may be duplicated and distributed separately to libraries for distribution to their subscribers.

This is not to be considered as the final selection. As experience and changing requirements dictate, new data bases will be added. Additional systems will continue to be investigated for possible inclusion. This manual will be revised to show any changes which may occur during this initial period of development.

Appendix B. contains information on costs for all data bases to be searched. These costs are broken down to include charges for each information center and each data base located at the University of Georgia.

The NERC-Cincinnati library will notify all interested EPA personnel of additional data bases, search services, price changes, and new library services as they are developed.

The types of searches provided are:

A. ON-LINE SEARCHING

On-line searching queries data bases instantly and provides immediate response between the user and the data base. Data base coverage depends on the amount of information in the computer and usually is limited to the last few years. Besides quick response, on-line searching is recommended as a way of testing for the presence of relevant material, or for refining a search strategy before going further or deeper into a data base.

MEDLINE is one example of our on-line retrieval system. Each article which enters the system is indexed under a number of subject terms. In retrieval, Boolean logic is used, and terms are linked using "and", "or" or "and not". Exact terms from MESH (Medical Subject Headings) must be used. Besides using subject terms, material may be searched by authors, languages, journal titles and year.

LEADER is the name of the on-line retrieval system at Lehigh University. Each document which enters the Lehigh University on-line system, with its affiliated noun phrases, is processed by a series of special programs which:

1. Isolate noun phrases for each document,
2. Isolate the component word stems of each phrase,
3. Create inverted files to link: word-stems to noun phrases, phrases to documents, phrases to associated phrases.

The on-line system has various data bases, based on the different document sources. Currently available are document corpora from:

1. Chemical Abstracts - This data base is derived from Chemical Abstracts. Currently, coverage includes from v. 72, 1970 thru current issues. Total documents of CA in system approximately 550,000 (Covers 12,000 journals).

2. Engineering Index (COMPENDEX) - Corresponds to the published Engineering Index volumes, and contains mostly applied engineering references. Currently, coverage includes from 1970 to date. Total number of documents

approximately 120,000 with abstracts each 10 lines (Covers 2,250 journals).

3. Civil Engineering - Recently initiated containing select articles pertinent to civil engineering.

4. MARC - A new on-line Library of Congress card catalog system is available for developing computer-produced catalog records. An English language monograph can be cataloged by using the L.C. card number, author, or title.

This is primarily a form of current awareness, on-line system, which provides quick retrieval and can be the basis for developing a more comprehensive batch retrospective search.

Other data bases will be added as soon as feasible. AMIC (Analytical Methodology Information Center) is a sample of a new data base. Since it covers water quality analysis it should prove to be quite valuable to many EPA laboratories.

B. CURRENT AWARENESS

Current awareness covers either the latest issue and/or each successive current issue from a data base and can be used to give a continuous flow of information from the computerized data base.

The current awareness service available through the library consists of a profile developed for a researcher that will be matched against the latest editions of data bases.

The profile is based on the researchers informational needs and coded to reflect retrieval terms. On a bi-weekly schedule this profile is matched against multi-discipline data bases containing journal articles and government reports. The output is printed on cards and sent to the requester. The cards consist of two parts - the smaller portion can be sent to the library as an order form and the larger portion (now a 3 x 5 card) can be filed by the researcher. A profile can be adjusted at any time to reflect changing requirements or professional interests.

A profile can be developed to combine terms, to weight them, or to eliminate irrelevant output. The following sample profile shows how terms can be selected, logic devised and terms weighted. Sample

cards have been selected to show the kinds of retrieval that can be expected from a current awareness service.

C. RETROSPECTIVE SEARCHING

Retrospective searching can go back as far as the user desires or to whenever the data base was established. Turnaround time for retrospective searches (known as a "batch mode") may be two to three weeks due to the size of the files. However, search results may be forwarded throughout this period as they are received rather than waiting until completion of the search.

Search results are usually mailed within two days after receipt of the tape. Retrospective searches are scheduled over a two-week processing cycle. Turnaround time for retrospective batch searches from receipt of initial profile (search question) to delivery of final search results may run two to three weeks. Search results are mailed throughout this period, however.

Special demand searches on frequency less than this two-week cycle may be requested. These are accommodated only at higher special rates for which the requester assumes the entire cost of computer runs.

Each question should be a fully descriptive paragraph describing the subject area to be searched and any qualifications, such as particular applications which are to be excluded. Suggested index terms or words frequently used in the research area under consideration are especially helpful. This step will be explained later in this manual. The search question, or profile, may be modified by the user, in order to obtain better search results. Maximum number of terms which can be processed in one search question, or profile, is approximately 200, depending on the length of the terms.

The search result is a bibliography for retrieved documents. The output includes the title, authors' names, location of work (if available on the data base), primary document citation, and all index codes or index terms available on the data base. Output on 8-1/2 x 11" one-part paper is standard output. Output on 4 x 6" card stock is available if desired, at additional cost.

Any combination of these services can be requested as well as any combination of data bases and years covered. These searches can be tailored to suit the users' needs and are extremely flexible. With experience these searches can produce a high rate of user satisfaction and relevancy in retrieved information.

In order to obtain maximum results from a computer search, it is necessary to state the question clearly and to provide additional information using synonyms and related terms. Guidelines on developing profiles to serve as keys to unlocking relevant information in the data bases will be discussed. EPA forms have been provided for reporting this data and this manual provides detailed instructions for completing these forms. These EPA forms need not be thoroughly completed but should include whatever information can be provided.

The library staff at NERC-Cincinnati will develop the profile or will call the user for more data, if necessary, to complete the profile. It is important that care be taken in preparing these profiles as they represent the most significant ingredient in a successful computer search. Each librarian should maintain a close liason with the user and the Cincinnati personnel in order to increase his/her knowledge on how best to use computer searches. The critical role played by the librarian will be the ultimate test as to the potential worth of the data base retrieval systems.

Another consideration is that more than one source has the same data base. Each librarian should decide on which source and information center can be of advantage -- based on years covered, user's time constraints and costs -- before reporting any preferences. The NERC-Cincinnati staff will make every effort to keep costs and turnaround time to a minimum.

If new services become available which will offer an advantage (e.g. better price structure, faster turnaround, more extensive coverage) then all participating locations and organizations will be so informed.

Appendix C contains sample printouts that a user might receive as a result of a computer search from the information centers being used.

Appendix D contains a chart of the interim organization of the NERC-Cincinnati Library and the names of staff members and their responsibilities.

Study of this manual should lead to an awareness of the user's and the librarian's role in properly accessing the vast amount of information now available. If there are any questions, please do not hesitate in writing or calling NERC-Cincinnati for assistance.

II. SEARCH STRATEGY

The following steps are designed to provide a logical sequence of events for successful retrieval of information. The summary provides a one-page outline of these procedures for quick reference.

STEP 1: USER INTERVIEW

To obtain pertinent references from the computer search, a clear concise statement of the question is essential. As the person who will benefit most from the search, the user, who will have the best understanding of his requirements, should be consulted. A discussion with him will help formulate a clear statement of need. He should also be questioned for other terms related to the search and synonyms used in the literature with which he is familiar. The result should be a well-conceived, written statement or paragraph complete with synonyms and related terms. If the user does not prepare this, then the librarian should write it with the guidance of the user.

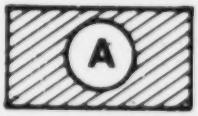
One specific point to be kept in mind while recording the question is the use of the conjunction "and". It is frequently interpreted as meaning the same as logical "or" as well as the connective "and". Consider, for example, the question, "I am interested in the effect of A on B and C." There are two potential questions represented:

1) the effect of A on B OR the effect of A on C, and 2) the effect of A on B in the presence of C. These questions imply different logic strategy, so care must be exercised in clearly stating the proper question. As a general rule, restrict the use of "and" in recording the question. It is better to develop short succinct statements than complex sentences. If possible, several abstracts or references relevant to the search should be included.

Figure 2 shows some examples of how a search request can be interpreted as a Boolean logic statement. Although this table shows only two (2) sets (A and B), more complex logic may be utilized. For example: A | B → E signifies the request for set A or B through E. A & B & ¬ F signifies A and B but not F. Try to keep the logic as simple as possible and to use more search statements. This approach will be far more efficient for computer operations.

At this time, a brief description of the various data bases should be given to the user, so he will have an idea which data base or bases will be most pertinent to his question. The scientists will be familiar with most of these in their field such as Biological Abstracts, Chemical Abstracts, Engineering Index, etc., and can decide which would have the best chance of giving results.

BOOLEAN LOGIC

Logic Statement	Boolean Statement	Venn Diagram
Search for a single set (sometimes called "descriptors") e.g. A	A	
Search for the presence of A and B	A & B	
Search for anything excluding set A	&¬A	
Search for anything containing set A or set B	A/B	
Search for anything containing set A or set B but exclude where both are present	A &¬B//B &¬A	

NOTE: The above illustrates the most commonly used logic in a search statement. For best results do not develop more complex statements. In this illustration the rectangle represents the universal set and the circle represents the logic set in question. The shaded areas represent the specified set(s) for retrieval. "AND" is shown as &; "OR" is shown as |, and "NOT" is shown as ¬.

FIGURE 2

As most data bases cover only recent years, the importance of retrospective coverage should be decided. Be sure all searches are limited to the years covered by the data bases, lest the librarian find she might be forced to commit her own time for manually supplementing the computer output. Cost may also be a factor as retrospective searches are more expensive since charges are usually based on a per volume or per year basis. A current awareness search covering only the most recent issue in a data base may be run to test the profile before requesting a comprehensive search.

STEP 2: CONCEPT IDENTIFICATION

Once stated, the question should be examined to identify the main concepts. In general, all nouns, including the objects of prepositions, represent a concept. For example, the question, "What papers deal with the analysis of fatty acids from tissues of mammals?" contains four (4) concepts. A good test is to try to reconstruct the question by converting adjectives to prepositional phrases. If the resulting question is logically correct and noun forms of the adjectives exist, the adjective represents another concept. Adjectives modifying nouns should be treated as part of the noun they modify. For example, "All papers concerning the use of acapella choirs in secondary schools" has true modifying adjectives.

STEP 3: SEARCH STRATEGY FORMULATION

The term "search strategy" is used to mean the number of search term groups and the Boolean logic relationships between the search terms. The strategy controls the way in which search terms will be combined to determine whether or not a given document is an answer to the profile. Several factors go into formulating the search strategy which will be used in the profile. The search strategy depends on the subjective judgment of the profiler. Experience and analysis of the search results should lead to be best strategy.

A. Subject Coverage

The nature and content of the data base itself will govern the strategy. If one or more of the concepts covers all of the subject scope of the data base, then it can be eliminated from consideration. For example, the concept "geology" in the question, "All papers dealing with the geology of the hilltop lake area of Ontario" is redundant with the subject scope of Bibliography of North American Geology: the data base contains only geology by definition. A question which is to be coded for both CBAC and CA-Condensates may be coded with a different strategy for each since CBAC covers only biochemical papers while the CA-Condensates coverage is very broad.

B. Data Elements

The data elements available in the data base will also affect the precision recall balance; and therefore, the strategy to be used. A data base such as Chemical Titles--which contains only titles--must have questions phrased much more broadly and with fewer concepts than does a data base which contains abstracts and/or index terms. Profiles which are to be run against title-only data bases should seldom include more than two concept groups. If the question contains more than two concepts, the librarian, in collaboration with the user, should select the two most important concepts. With indexed data bases, especially when the vocabulary is thesaurus-controlled, the number of groups may be three or four, or higher, if necessary. Precision of the search and recall of relevant documents are inversely proportional; if there are few groups, the recall is better, but the precision suffers. The user should specify his requirements of retrieval; it is then up to the librarian to construct the profile to meet the user's needs.

STEP 4: CONCEPT EXPANSION

Concept expansion is a translation of the question from the language of the user to the language of the information file. Each concept identified in the question must be expanded to a list of synonyms and related terms or replaced by thesaurus

terms or codes. Each concept will normally form one group in the final logic expression with the terms in the group linked by "or" logic. Groups are usually linked by "and" or "not" logic although there are no restrictions to these logic operators.

Depending on the data elements available in the data base for search, two conditions may exist. The data element may have a completely uncontrolled vocabulary. That is, no restriction is placed on the words which may be used. This is commonly the case with titles and abstracts where the choice of words is left up to the author or abstractor. (Sometimes this approach is called "free-text searching.") Vocabulary-controlled data elements, on the other hand, imply use of some authority list or thesaurus for approved words or terms. Index terms and subject classification areas or codes are frequently thesaurus-controlled. Expansion of the concept must be done differently for these two types of data elements in order to effect retrieval.

For uncontrolled vocabulary data elements, such as titles and abstracts, it is necessary to construct a list of synonyms or related words for the concept term. In essence, the librarian with the user's help tries to predict all possible ways the concept may have been expressed by authors. In areas with which the librarian is unfamiliar, a basic text can provide background and general knowledge of the concept.

It may also suggest synonyms and related concepts which should be included in the term list. Search guides, such as the CAS Search Guide (Figure 3) which contains narrower terms (NT), related terms (RT), synonyms (SY or S*), and broader terms (BT), are valuable as memory joggers.

Amino Resins

A-Stage Resins
BT Thermosetting Resins
RT Phenol-Formaldehyde Resins
SY Resols

Abandonment
RT Depletion
RT Life (Non-Biological)

Abatement
RT Damping
RT Dilution
RT Disposal
RT Purification
RT Reduction

Abdomen
RT Gut

Abdominal Dropsy
S* Ascites

Aberration
RT Distortion
RT Images
RT Interference
RT Lens
RT Reflection
RT Refraction

Abies Sibirica
BT Abis
BT Evergreens
BT Pinaceae
SY Siberian Evergreen

Adietic Acid
RT Rosins

Abiogenesis
RT Biogenesis
SY Spontaneous Generation

Abiogenic Synthesis
BT Synthesis (Chemical)

Abiosis
S* Death

Abis
NT Abies Sibirica

Ablating Polymers
BT Polymers
RT Ablation

Ablation
RT Ablating Polymers
Burning
RT Combustion
RT Cooling
RT Melting
RT Vaporizing

Abnormal Growth
RT Hypertrophy

Abnormal Response
RT Sensitivity

Abnormalities
RT Diseases

Abnormalties
RT Irregularity
RT Malformation

Abo Factor
RT Glood Groups

Abo Incompatibility
RT Blood Platelet

Abode
RT Habitat
RT Home
RT Residence

Abrasion
RT Abrasive Blasting
RT Abrasives
RT Erosion
RT Friction
RT Gilling
RT Grinding
RT Metallography
RT Perforating
RT Polishing
RT Rubbing

Figure 3. CAS Search Guide

Figure 4 shows the concept "chromatography" as it might be expanded for a chemistry search in the uncontrolled vocabulary data base CA-Condensates. Abbreviations, acronyms, and alternate spelling must all be taken into account if editorial policies of the particular data base permit them.

Chromatography
Chromatographic
Chromatogram(s)
Chromatog
gas-liquid chromatography
gas liq chromatog
gas chromatography
vapour phase chromatography
vapor phase chromatography
thin layer chromatography
paper chromatography
V.P.C.
VPC
T.L.C.
TLC
G.L.C.
GLC
G.C.
GC

Figure 4 Concept Expansion

The task of concept expansion is similar for thesaurus-controlled data elements except that all terms must be taken from the authority list. Instead of predicting the author's choice of words, the librarian must know the thesaurus and have a working knowledge of the indexing policies used in the assignment of index terms. The hierarchy of index terms must be taken into consideration in formulating the term list. For example, all papers in ERIC reporting occupational education of employees would not be retrieved by the broader term

"personnel" since "employees" is also a term. In other words, there is no hierarchical posting to higher or lower level terms.

Data element types can be mixed during expansion of concepts. A biological profile might include text terms (title, abstract, and free index terms), biosystematic codes, cross codes, and Registry Numbers, many as synonyms for each other. This usually occurs when a given profile is to be searched against two or more data bases which have different data elements. Librarians should use some judgment as to whether it is better to write separate profiles for each specific data base or to combine the profiles using data base specific data elements as synonyms.

The search time is proportional to the number of search terms, and the amount of core required for the profiles is determined to a large extent by the number of different data elements. Consequently, the economics of the computer search would dissuade the use of large numbers of non-productive terms and/or data elements. On the other hand, profile maintenance of a question which is run in several data bases can be difficult to control if many different profiles must be modified or updated. The choice should be based on the degree of similarity between the profiles which would be written independently. Remember, too, that the data bases themselves may be dissimilar enough to warrant different strategies for the same question.

During the process of expanding the concepts, it is frequently necessary to revise the search strategy formulated in the preceding step. Some concepts are almost impossible to expand into any reasonable set of terms which will effect retrieval. In such cases it is usually better to omit the concept from the coding. This may cause some irrelevant retrieval, but there is less chance that relevant papers will be missed because of an inadequately expanded concept. It may also be better to revise the strategy to exclude irrelevant material than to formulate the strategy to select only precisely relevant documents. This negative approach is particularly ueful when the data base is vocabulary-controlled or has been classified into subject areas. Techniques for refining both the profile terms and the search strategy are discussed in the next step.

STEP 5: PROFILE REFINEMENT

There are several techniques available for refining both the search terms and the search strategy. These include term truncation and weighting. It is also possible, where a data base is available on line, to do a short search to test the validity of the selected terms before running a more expensive and lengthy retrospective search.

a. Truncation

Term truncation is a technique used to retrieve terms containing word fragments which are common to two or

more different forms of the word. For example, the singular and plural or adjectival and adverbial forms can be retrieved by a single term. Thus, the term *OXID* will retrieve DEOXIDATION, OXIDIZED, OXIDATION, OXIDE, OXIDES, etc. The asterisk (*) placed before and/or after the word fragment is interpreted by the search program to mean "accept any character, including a blank, as valid in the position shown as asterisk." Figure 5 illustrates the four possible modes of truncation and examples of each.

Term	Explanation
CELL	Retrieves terms only if bounded by blank spaces or punctuation; e.g., CELL, CELL-FREE, STEM-CELL.
CELL*	Retrieves the term followed by any character, including a blank space and preceded by blank spaces or punctuation; e.g., CELL, CELL-FREE, CELL., CELLPl/4JAME, CELLS, CELLULAR, etc.
*CELL	Retrieves the term preceded by any character, including a blank space and followed by a blank space or punctuation; e.g., CELL, CELL-FREE, STEM-CELL, MICROCELL, etc.
CELL	Retrieves the term preceded and/or followed by any character, including blank spaces and punctuation; e.g., CELL, CELL-FREE, ACELLULAR, MICELLES, CELLULOSE, etc.

Figure 5 Term Truncation Modes

If carefully used, truncation can significantly decrease the number of individual search terms which have to be listed.

It can also improve retrieval in that word forms which might otherwise be overlooked will be automatically retrieved. It can also be dangerous if misused. Word roots carelessly truncated can cause large numbers of irrelevant documents to be retrieved. The choice of appropriate truncated terms is aided by reference to KWIC indexes in the printed publications or to word frequency dictionaries available for some data bases. A good rule-of-thumb is to avoid word roots of three characters or less with both prefix and suffix truncation. There are occasions when such small word roots can be used effectively, but they are rare.

Although there are four possible modes of truncation, not all modes can be used for all data elements. Each data element is classified as one of two types: left-anchored (LA) or free text (FT). The classification determines the manner in which the data element is searched. For left-anchored elements, the match always begins with the left-most character. This implies that the format and content of the data element are known. Examples of this type include Registry Numbers, Cross Codes, authors' names (inverted), and thesaurus-codes. Only suffix (right hand) truncation (or no truncation) can be used with left-anchored terms. The only restriction is that the truncation asterisk cannot immediately follow any special character, including a blank.

These are the first two modes shown in Figure 5. The second class of data elements character strings in the data base. Examples of this type data element are titles, abstracts, and free index terms. All four modes of truncation are applicable to free text fields.

b. Weighting

In a free text search system such as this, not all the profile terms used in concept expansions are equally significant with respect to the question. Consequently, a technique called "weighting" is available as an optional feature to assign relative numeric values to the terms. There are two principal uses of weighting, each of which will be discussed in greater detail. One use is to sort the answers into order of probable importance. The second use is an extension of the search logic.

A suggested simplified approach to weighting can be taken by ranking the selected terms. Give each term or rank a number, starting from 1 as the most important, 2 the next most, etc. More than one term can have the same rank of importance. The Technical Reference Librarian at Cincinnati receiving the request will interpret the ranking for computer searching. Initially, a librarian may want to avoid weighting and should treat

this aspect of a computer search only as an optional feature. With more experience the librarians can prepare profiles involving the more complex approach described below.

Weights for computer searching are positive or negative numerical values assigned to search terms. Numbers must be in a positive or negative five figure range. In a weighted search, the terms within a group may have different weights, and some terms may have no weight assigned. No specific order of weighted terms is required. A weight of zero (0) is assumed unless otherwise specified. A threshold weight can also be assigned to the question. It is not necessary to code weight with leading zeros.

Use of weighting for sorting (Threshold weight equal 00000)

Weighting may be used to sort the search results by assigning relative term weights to the index terms. The most important words (according to the user) are assigned the highest numeric values, and less important terms are given lower values. The sum of the term weights for a document may be added together to give a question weight for that document. Output search results are sorted for

each user in descending question weight. Thus, the documents which hit on the most important term(s) will have the highest weight and will sort first, followed by the remaining citations in descending order. For searches in which weighting is used only for sorting, the threshold weight for the profile is left blank (i.e., has a value of zero).

If the threshold weight for the question is zero, then weighting is calculated non-cumulative. That is, the weight assigned to each term is counted only once for each citation, regardless of the number of times the term occurs in the citation. The results are sorted in descending order on the question weights calculated as the sum of weights (non-cumulative) for all terms which "hit". The non-cumulative weight is printed on the output. This type of weighting (no threshold weight) is used exclusively for ordering output.

Use of weighting as logic (Threshold weight not equal 00000)

Weighting may also be used as an extension of the "and", "or", and "not" logic. "Not" logic, for example, is absolute. If a document hits on a "NOT" term, the document will not be retrieved even if it also contains desired terms. By use of term weights and a threshold

weight for the question, undesirable terms alone will not cause retrieval, but the document will be retrieved if desired terms are also present. In other words, a threshold weight may be assigned to a profile such that the sum of the hit term weights must be equal to or greater than the threshold weight.

It should be emphasized that weighting of terms is an optional and not a necessary technique for developing search strategies. Only those with some experience or knowledge of a data base should consider using weighted terms to any extent. Furthermore, weighted terms should only be used for current awareness or retrospective search and not for on-line systems.

For example, if the threshold weight for the question is not equal to zero (either positive or negative), weighting is calculated cumulatively for all occurrences of all terms in the data base. This allows a simulation of "ignore" logic by judicious use of positively and negatively-weighted terms when truncation would otherwise cause problems. The cumulative weight is used to test against the threshold weight to determine whether or not the threshold weighting is satisfied. The search results are sorted in order of the non-cumulative weights for all terms which "hit". The printed weight for the question,

however, is the cumulative weight. Consequently, the search output may not always appear to be in strict order by question weight.

Negative weighting can be used in place of "NOT" terms, especially where a few words consistently cause problems in conjunction with truncation. Consider the term *ASE which is frequently used in biochemistry for retrieving enzyme names. However, it also retrieves words such as "decrease," "increase," "phase," etc. If the term *ASE is assigned a positive value (e.g., 100) and the terms DECREASE, INCREASE, PHASE, etc., are assigned an equal but negative value (e.g., -100) with the threshold weight of 100, then a paper reporting an increase of oxidase still will be retrieved. If only an undesired term matches, then the question weight would be negative and less than the threshold weight necessary to cause retrieval.

STEP 6: PROFILE CODING

Once the search strategy has been formulated, the concepts expanded to search terms and refinements such as truncation and weighting noted, the profile is coded for computer search using the "Computer Search Information Request," EPA 2170-1, abd tge "Profile Coding Logic" form EPA 2170-2, (Figures 6 and 7).

If possible, the current awareness files should be searched first to test the profile. The profile may need to be modified before any retrospective searches are made.

If the computer search originates from a laboratory outside Cincinnati, these two forms "Computer Search Information Request" form and "Profile Coding Logic" form, together with sample abstracts, sample references, or any other material which will help the search are to be sent to:

Environmental Protection Agency
NERC-Cincinnati
Cincinnati, Ohio 45226
Attention: Technical Reference Librarian

Page ____ of _____

COMPUTER SEARCH INFORMATION REQUEST

Date _____

MAIL TO:

Environmental Protection Agency
NERC-Cincinnati
Cincinnati, Ohio 45226
Att: Technical Reference Librarian

TO BE COMPLETED BY ORIGINATING OFFICE:

LAB NAME _____

USER'S NAME _____ PHONE NO. _____

USER'S NO. _____ USER'S 1st REQUEST ( ) YES ( ) NO

LIBRARIAN _____ PHONE NO. _____

ACCOUNTING SYMBOL _____

MAILING ADDRESS: _____
(to which material should be sent) _____
_____
_____
_____

DETAILED STATEMENT OF REQUIREMENTS: Please describe, as specifically as possible, the subject matter for which the search is to be conducted. Define any terms that may have special meaning. If there are points NOT to be included, please state these. Include language statement (English and/or non-English). Use additional page if necessary.

_____ _____

THRESHOLD WEIGHT _____ BOOLEAN EXPRESSION _____

_____

ON-LINE SEARCH: YES ____ NO ____ BATCH SEARCH: YES____ NO ____

DATA BASES TO BE USED AND YEARS COVERED: _____

AUTHORIZING SIGNATURE _____ DATE_____

TO BE COMPLETED BY NERC-CINCINNATI LIBRARY:

USER'S PROFILE NO. _____ DATE REC'D. _____ DATE COMP._____

LIBRARIAN _____
(SIGNATURE)

PROFILE CODING LOGIC

This form is to be completed whenever the originator desires to develop his/her own coding logic as a means of expediting the search. Please attach this to the Search Information Request.

User Name _____

User No. _____

Librarian's Name _____

Date _____

Please rank the terms in the order of importance.

GRP	WEIGHT	DEM	TERM

Request Reviewed: _____ Date _____
Signature

EPA Form 2170-2 Figure 7

The person preparing the forms should keep one copy of the request at least until such time as a printout is received. The other two copies should be sent to NERC-Cincinnati, using the address printed on the "Computer Search Information Request" form, (EPA Form No. 2170-1).

In preparing the "Computer Search Information Request" form, the first part should be completed at the originating office. The name of the laboratory or organization, the name of the user, his/her phone number, the mailing address for the printout are self explanatory. If a librarian is completing the form, then the librarian's name and phone number are to be entered. User number is for the originating organization's internal use. The appropriate answer for first time usage should be checked. Accounting symbols refer to the account number against which the search will be charged. Each requesting organization will be required to pay for all external expenses incurred in the course of answering a search request.

The detailed statement of requirements should be completed next. If desired, (and only as an option) the user or originating librarian may enter a threshold weight and a Boolean logic expression. If this option is not exercised, the NERC-Cincinnati staff will complete the form or will call the originator for clarification.

The search questions and data base questions must be answered as fully as possible. The authorizing signature is for use by the user's division chief, or equivalent, and is necessary only to discourage ephemeral usage of the retrieval system. The form can be folded so that the address of NERC-Cincinnati can be seen through a window envelope. The bottom portion will be completed by the NERC-Cincinnati staff and one copy will be returned with the printout. If a series of printouts are to be sent back, the form will be attached only to the last one to indicate the completion of the requested search or profile.

The "Profile Coding Logic" form (EPA Form No. 2170-2) is optional and may be used with discretion. However, if it is completed, it will greatly expedite the request, as it will be entered into the computer system with only a check for accuracy and completeness. In addition to saving time and producing faster turnround, the librarian or user who completes this form will most likely obtain greater accuracy and less irrelevant output. Thus, the completion of this form to the extent possible is urged upon each and every user.

Each search term entry consists of up to four types of data. The Group Number, labeled GRP on the form, is a four character string, consisting of the letter G and three digits (e.g. G001). Leading zeros must be coded in all cases. Group numbers are used to link all terms for a given concept. All terms within

a given group are linked by "or" logic by definition. However, a group can consist of a single term, as well as many terms. There is no limitation on the number of terms which may be included in any group. However, there is a maximum of 240 terms or 1920 characters (whichever occurs first) which may be used for the entire profile. Group numbers must be assigned sequentially, starting with G001. No group number may be omitted.

The term weight can be up to 6 characters. This concept was previously discussed in this manual. The weight number can contain both a plus and minus sign or be preceded by a minus sign if appropriate. The plus sign is assumed and is never coded. Unless weighting is indicated as being desirable, the absence of any reference to this feature will result in all terms being given equal value. Weighting is usually not necessary for most searches.

DEM represents the Data Element Code. This is a three character acronym for the data element type which is being searched. The valid acronyms and their corresponding data element names will be furnished upon request. The value of using the DEM can be exploited only after gaining experience with profiling.

In addition to the specific data element codes given in the chart, there is one general code, TXT, which may be used to indicate that the title, abstract, and free index terms are

to be searched. This will undoubtedly be the most commonly used DEM. Unless otherwise indicated, TXT will be assumed.

The fourth element is the search term itself. Truncation is indicated by asterisks preceding and/or following the characters of the search term. Note that an asterisk can never appear within a search term, only as the initial or final character. Ther term may consist of alphabetic, numeric, or punctuation characters. However, all punctuation characters will be converted to blanks in the search, both in search terms and the data base. Punctuation should be included where appropriate since these characters (hence the corresponding blank spaces) are counted in the overall term length. Terms which are identical except for punctuation (e.g. NMR and N.M.R.) need be coded only once. The maximum length of a term, including truncation asterisks and imbedded blanks, is 59 characters. Be sure to use only one term per line. It is better to use more paper for describing a search than take the chance of confusing the person entering the request into the computer.

The Boolean Expression is a statement of the search logic. It consists of the group numbers, any combination of the logic operator symbols "&", " ", and "&¬", and parentheses. "Not" logic is indicated by the two symbols "&" without intervening punctuation. Another convention which can be used

are the key words "and", "or", and "and not" enclosed within periods (e.g., .and., .or., and .and. .not.). Full Boolean logic operations are permitted. The maximum length of the Boolean Expression is 180 characters. The "or" operation is the inclusive or; that is, A|B is true if either A or B or both are true.

Every profile must have a Boolean Expression, even if there is only one group. Parentheses can be used to improve readability or to alter the order in which the logical operations are performed. Without parentheses, the logic operations are performed in the order "not" equal to "and" greater than "or", working from left to right for operations of equal value. For example, in expression (4) in Figure 8, the "and" operation between G002 and G003 would be performed first, followed by the "or" operation with G001. Thus, the two expressions (3) and (4) are equivalent. Expressions (7) and (8) are different, however. In (7) the "and" operation between G001 and G002 is executed first followed by the "or" with G003. Operations within parentheses are executed before all other operations. The parenthesis in (8) causes the (G002 | G003) part of the expression to be evaluated first, followed by the "and" operation with G001. If in doubt about the order in which operations will be performed use parentheses.

(1) G001

(2) G001 & G002

(3) G001 | (G002 & G003)

(4) G001 | G002 & G003

(5) G001 & G002 & G003

(6) G001 | (G002 & G003) & G004

(7) G001 & G002 | G003

(8) G001 & (G002 | G003)

(9) G001 .and. (G002 .or. G003) .and. .not. G004*

*Although available, this type of logic notation is not ordinarily used because of the time and space involved.

Figure 8 Typical Boolean Expressions

The last line on the form labeled "Request reviewed" and date is for use by the Cincinnati librarian who has reviewed the request. Feel free to photocopy or Xerox these forms until the official version is available. The library staff at Cincinnati is available to answer any questions about entering a request or completing these forms. Write or call if help is desired. In return, if it is found that incomplete information or ambiguities will delay a request from being answered, a librarian in Cincinnati will call for clarification rather than simply returning the request.

Upon completion of the computer search, the requesting librarian should complete the User Evaluation Form (sometimes called "feedback" as shown in Figure 9). The purpose of this is to allow NERC-Cincinnati to determine how to improve service where necessary.

NERC-Cincinnati will inform all participants in this network of any changes that may occur. If the users would like NERC-Cincinnati to publish information such as successes, problems, suggestions, search results, etc., please let us know. As of now the "Library Scene" (New Additions) will carry a list of the successful searches and will supply copies upon request.

Free subscriptions and additional copies are available upon request and are encouraged as a way of publicizing these computer searches.

Page _____ of _____

USER EVALUATION

Lab Name _____

User Name _____

User Profile Number _____

Librarian's Name _____

Search Question _____

_____

_____

_____

_____

How do you rank the search? (check one)

(1) Very Good _____

(2) Good _____

(3) Fair _____

(4) Poor _____

Suggestions and/or recommendations for improvement _____

_____

_____

_____

_____

Figure 9

III. SUMMARY

A typical search strategy should follow these ten (10) procedures:

1. User Interview to obtain clear statement of search question with list of synonyms and related terms. Decide on data bases to be checked and years to be covered. Include related abstracts or references if possible.
2. Concept identification.
3. Search strategy formulation.
4. Concept formulation.
5. Profile refinement.
   a. Truncation
   b. Weighting
6. Fill out profile coding form. Keep copy.
7. Fill out search information form. Keep copy.
8. Keep records by user name or own numbering system. Allow a maximum of two weeks for return printout when requesting large batch search services.
9. Check with uer when search is returned.
10. Send in user evaluation form.

APPENDIX A

DATA BASE DESCRIPTION

1. Bibliography of North American Geology.

Published since 1887, the *Bibliography of North American Geology* was first computer-produced in 1965 for the 1961 annual volume. The *Abstracts of North American Geology* began publication in 1966. *Geophysical Abstracts*, a related publication by the U.S. Geological Survey, was first published in 1929, and ceased publication in December, 1971, the date through which the *Bibliography of North American Geology* will also cease. (For literature coverage subsequent to 1971, use the GEO.REF data base)

This bibliography lists publications concerning the geology of the North American continent, Greenland, the West Indies and adjacent islands, Hawaii, Guam, and other island possessions, but not the trust territories of the United States. Articles by American authors published in foreign journals are cited if they deal with North American localities or are of a general nature, but not if they deal with foreign areas. Articles on North America by foreign authors are included regardless of the place of publication, while those of a general nature are included only if they appeared in North American journals.

2. Biological Abstracts-Previews (BA-P).

The magnetic tape of *Biological Abstracts-Previews* makes references from *Biological Abstracts* (BA), semi-monthly, and *BioResearch Index* (BRI), monthly, available a full month ahead of publication. The BA-P tapes, published since 1969, are issued three times per month. The BA and BRI tapes were also published in 1968.

Tape records of 140,000 papers, an average of 6,000 per issue, were reported in BA, and 90,000 additional papers were reported in BRI, an average of 7500 titles per issue (1970). As of May 30, 1972, BA and BRI together contained approximately 750,000 document records.

Approximately 8,000 primary publications originating in 97 countries and territories are covered by BA-P. Research articles covered have been classified into more than 580 subject specialties (interest areas). Basic research articles are covered by BA, but applied research articles such as letters, institutional and government reports, bibliographies, reviews, papers from symposia and semi-popular journals, are covered by BRI.

3. CA-CONDENSATES.

CA-Condensates is a weekly computer-readable service that provides the following searchable data items from the corresponding issue of *Chemical Abstracts* (CA): titles of papers, patents, and reports; names of authors and

assigness; bibliographic citations; and phrases from the CA issue Keyword Index. There is no accompanying printed version of *CA-Condensates*. The service is designed to provide the user with the capability to scan rapidly by title and key-word the pertinent content of some 250,000 new articles and patents each year.

Publication of the tapes began with Vol. 69 (July 1968). Two volumes of 26 issues each are published per year.

4. Cataloging and Indexing (CAIN).

The initial CAIN tapes (3 reels) designated "CAIN 1969", contain 42,667 records. The January, 1970, tape records are included in the CAIN 1969 volume. Approximately 5,500 tape records are produced monthly, depending on the number of publications received and processed by the National Agricultural Library.

Approximately 11,000 publications are covered by CAIN. Tape records are produced monthly and are divided among 18 broad subject areas providing bibliographic data concerning the literature of agriculture and related sciences. Journal articles, pamphlets, government documents, including USDA, state experiment stations, and extension service publications, special reports, etc., received by the NAL are sources for entry of data on the CAIN tapes.

CAIN contains about 100,000 records to date.

5. Chemical-Biological Activities (CBAC).

Chemical-Biological Activities (CBAC) is a biweekly tape service supplied by Chemical Abstracts Service containing digests of current technical articles related to the field of biochemistry. CBAC covers the scientific literature that reports the interactions of organic compounds with biological systems as well as related metabolism and in-vitro chemical studies.

About 600 journals are referenced in CBAC per year. Two volumes of 13 issues each plus Cumulative Indexes for each volume are published each year, dating from January, 1965. A total of 110,000 digests were publlished in the first 12 volumes (Jan. 1965 - Jan. 1972); an average of 9100 digests/volume.

The separate printed copy of CBAC ceased in December 1971. It is contained in the first five section groupings of Chemical Abstracts, the Biochemistry Sections.

6. Chemical Titles (CT).

Chemical Titles (CT), available from January 1962, published biweekly, is a current author and keyword index of recently published articles from approximately 700 of the world's most active chemical and chemical engineering journals.

Articles are input using only words in title, author(s) name(s) and journal reference. There are 26 issues per year with approximately 5,000 titles cited per issue.

7. Computerized Engineering Index (COMPENDEX).

COMPENDEX is the computerized version of the *Engineering Index*. The *COMPENDEX* data base, containing the input to the *Ei Monthly* for each issue from January 1969 to the present, provides rapid access to over 7,000 abstracts monthly, reflecting the contents of 3,500 sources of worldwide technical information and the work of 88,000 authors. It covers all fields of engineering and certain related fields of science and management, pertinent quality research and applications literature; assembles the various engineering disciplines side by side with interconnecting cross references.

Users have the option of searching the complete record (full text search) or searching selectively on chosen data elements: Subject heading and subheading, document ID number, author(s) Ei abstract number, codes assigned to the CARD-A-LERT service divisions, on most records the access words (which are cross references chosen for the printed version of *COMPENDEX*), and on most records the free language terms.

Abstracts are included.

8. Current Information Tapes for Engineers (CITE).

The CITE tapes for Plastics and Electrical/Electronics were first issued in 1965. The service originally called the U.P.P. (User Participation Program) became, in 1968, the CITE service, or Current Information Tapes for Engineering. The Plastics Monthly and CITE service were continued until December 1969. The E/E Section was discontinued in December 1967.

The CITE tapes containing input in Plastics Engineering of some 30,000 articles covering the years 1965 through 1969 and some 60,000 in Electrical and Electronics Engineering for the same time period, are for retrospective searches only.

9. Educational Resources Information Center (ERIC).

The ERICTAPES comprise the magnetic tape copies of the Educational Resources Information Center (ERIC) files, consisting of 30,000 report resumes from 1966 on, 12,000 journal article citations from 1969 on, and a thesaurus.

The Report Resume Files consist principally of resumes of research reports filed by contractors and grantees on the results of funded educational research. The Journal Article Resume Files contain resumes of journal articles on educational research selected from over 500 education and education-related journals. The Thesaurus File is a complete Thesaurus of ERIC Descriptors from which subject indexing terms are selected for both report and journal article resumes.

Under special authorization from the U.S. Office of Education, these tapes are available only by purchase from LEASCO Systems & Research Corporation.

10. Environmental Protection Agency (EPA) funded data bases:

a) *Analytical Methodology Information Center* (AMIC).

The AMIC computerized data base was established in 1971 by Battelle, Columbus Laboratories, Columbus, Ohio, under contract for the EPA, to inform the personnel of the Analytical Quality Control Laboratory (AQCL) and other segments of the National Analytical Methods Development Research Program of recent publications on methodology.

Each month AMIC adds to its data base approximately 200 indexed and abstracted current reports on methods for determining the indentity, concentration, and ecological effects of pollutants, and measuring water quality. Subject areas covered by AMIC include biology, chemistry, instrumentation, microbiology, and quality control.

The current awareness bulletin, *Reviews of Current Literature on Analytical Methodology and Quality Control*, containing the abstracts is published monthly. There are now over 3200 documents in the data base.

10. b) Environmental Information Retrieval On-line (ENVIRON). ENVIRON is a new EPA system which replaces the Technical Information Management Planning System (TIMPS) established in 1970 by the Research Information Division, Office of Research & Monitoring, E.P.A., Washington, D.C.

This system utilizes a software package STIMS/RECON which was developed by Informatics, Inc., and will be run at the computer facility of COMNET (Computer Network), Washington, D.C. EPA users throughout the country will have telephonic access to the data bases at the COMNET facility in an on-line real time environment.

The data base contains pertinent information on all of the research and monitoring grants, proposals, projects and final reports generated by or for EPA. This includes:

Proposed R & M Projects
Active R & D Projects
EPA R & D Project Report System
Solid Wastes Projects
Water Quality Surveillance Network
Marine Biological Literature
Industrial Waste Literature
Oil and Hazardous Materials (Oil spill data: TADS (Technical assistance data system)

c) EPA library files.

The library files will consist of references to all EPA reports and publications, including predecessor agencies and the journal holdings of the EPA libraries. The book catalogs of EPA libraries, as soon as they are available, will also be added to these files.

d) Solid Waste Information Retrieval System (SWIRS).

The SWIRS data base covers the period from 1964, including both periodical and non-periodical literature of the world on solid waste management; for the period 1941 through 1963, see Public Health Service Publication No. 91 and Supplements A through F, which contain all-inclusive solid waste management bibliographies.

The current awareness bulletin, *Accession Bulletin, Solid Waste Information Retrieval System*, is published monthly to keep readers abreast of the solid waste management information being published. There are over 13,000 abstracted items in this data base, containing a description of the contents of the documents being added to SWIRS and giving a complete bibliographic citation.

11. Geological Reference File (GEO.REF).

GEO.REF is the data base originated by the Geological Society of America, in cooperation with the American Geological Institute. The GEO.REF tapes are available beginning with 1967. The bibliographic information dates from 1965, however. The printed publication corresponding to this data base is *Bibliography and Index of Geology*.

This data base covers world-wide literature on geology and related technologies selected from over 2,000 serials and special publications. Entries are classified under 21 categories, which include such disciplines as Geochemistry, Geochronology, Paleontology, Stratigraphy and Structural Geology.

12. Geophysical Abstracts (GPA).

GPA data base covers the years 1966 through 1971, when *Geophysical Abstracts* printed copy ceased publication. May be searched for retrospective searches only. The *Bibliography of North American Geology*, which includes the material published in *Geophysical Abstracts*, and also published by the *U.S. Geological Survey*, will cover material through December 1971 and cease publication.

The *Geophysical Abstracts* covers articles from journals and other publications dealing with geology world-wide.

For literature coverage subsequent to December 1971, see GEO.REF data base.

13. Institute for Scientific Information (ISI) Science Citation Index.

The ISI *Science Citation Index* tapes (source and citation) cover the current literature of science and technology (including the social sciences). They contain bibliographic information about the source articles, and also about the references cited in those articles, which are covered in the five sections of *Current Contents*, approximately 8,000 current items each week.

Dating from 1964, coverage is comprehensive and includes all items (other than advertisements and ephemeral notices) in approximately 2,500 key scientific journals.

File size (1971): 2,538,000 records (source items) with approximately 410,000 items added per year.
File size (1971); 32,000 items (cited references) with approximately 5,000,000 added each year.

14. Machine Readable Catalog (MARC II).

MARC is the production of *Library of Congress* cataloging data in computer readable form. The format was implemented in June 1968. At present, MARC II cataloging data is limited to English language monographs which also

includes government reports/documents, and conference proceedings. Plans for expansion to cover monographs in French and German are being studied. MARC is available on-line and will be used as the basis for NERC-Cincinnati library providing scientific and technical cataloging service to any EPA library that so requests.

15. MEDLINE

MEDLINE (acronym for *MEDLARS* On-Line) is a new service from the National Library of Medicine. It provides on-line bibliographic searching of biomedical journal literature. The data base includes more than 400,000 citations with index terms from 1,138 of the most important periodicals indexed for *Index Medicus*. Coverage is from Jan. 1, 1969 to the present. *MEDLINE* is accessed by telephone lines, and a nationwide communications network became operational early this year. Toll-free lines are provided to the *MEDLINE* data base in about 35 cities. Other cities pay charges to the closest node in the network.

Interactive dialogue is one of the most important features when a question is initiated at a *MEDLINE* terminal. This allows a question to be negotiated for the best possible retrieval. Twenty-five citations may be printed on-line and up to 300 citations may be requested for off-line printing at National Library of Medicine with their high speed printer. These will be sent air mail either the same evening or the next morning.

By the end of this year between 100 and 150 institutions are expected to be *MEDLINE* users. The users are medical schools, hospitals and research institutions.

16. National Technical Information Service (NTIS).

The *U.S. Government Reports Announcements* (USGRA) and *U.S. Government Reports Index* (USGRI), formerly called the *U.S. Government Research and Development Reports* (USGRDR), tapes are issued twice monthly, 24 issues per year; approximately 50,000 document records are added per year.

The National Technical Information Service (NTIS), formerly the Clearinghouse for Federal Scientific and Technical Information (CFSTI), began making available magnetic tapes of its U.S. Government Research and Development Reports (USGRDR) beginning with the January 10, 1970 issue. With Volume 71, Issue No. 6, March 25, 1971, the name of the NTIS's announcement journal changed from *U.S. Government Research and Development Reports* to *Government Reports Announcements* (GRA), and includes technical publications of the Department of Commerce which are not research and development reports, as well as the research and development reports previously being covered. A similar change was made in name to the *U.S. Government Research and Development Reports Index* (USGRDR-I), which became *Government Reports Index* (GRI).

The USGRA tapes cover new U.S. Government-generated research and development reports and translations of

17. Nuclear Science Abstracts (NSA).

Nuclear Science Abstracts (NSA) is a semimonthly publication of the USAEC Office of Information Services, published by the USAEC, Technical Information Center. There are 24 issues/year or volume.

A total of 450,000 abstracts were published in the first 21 volumes (1948-1967). The annual volumes now contain approximately 47,000 abstracts each.

NSA, as a hard-copy publication, began in 1948. The first computer files available began with Volume 20, Issue No. 12, (mid-1966). NSA provides the only comprehensive abstracting and indexing coverage of international nuclear science literature. It covers scientific and technical reports of the U.S. Atomic Energy Commission and its contractors, other U.S. Government agencies, other governments, universities, and industrial research organizations. In addition, books, conference proceedings, individual conference papers, patents, and journal literature on a worldwide basis are abstracted and indexed.

Printed Publications and Aids for using *Nuclear Science Abstracts* are:

TID-4552 (Rev. 5), *Subject Scope of Nuclear Science Abstracts*

TID-4577 (Rev. 3), *Descriptive Cataloging Guide*

TID-5001 (8th Rev.), *Subject Headings Used by the USAEC Division of Technical Information*

TID-4579 (2d ed.), *Serial Titles Cited in Nuclear Science Abstracts*

TID-4576, *Guide to Abstracting and Indexing for NSA*

NSA Field Words

Lawrence Radiation Laboratory Frequency Count of Euratom Selectors and Category List

Nuclear Science Abstracts

IAEA-INIS-13 (Rev.) *INIS: Thesaurus*

Terminology Trees for the Euratom Thesaurus prepared from the Indiana U. Tapes at IRL - Berkeley, May 1970.

TID-4578, *Subject Modifier Guide*

NSA Entry and Selector File Formats

TID-85, *Report Number Series Used by the Division of Technical Information in Cataloging Reports*

Janaske, Paul C., et al. *COSATI Subject Category List*, Report AD-612 200, Federal Council for Science and Technology, December 1964.

NSA Selector Authority List, NSA 25:02, printed from tape

The tapes contain the primary document citation, including ASTM Codens and abbreviated titles, the title of the article, additional thesaurus controlled indexing terms and subject codes, location of work, authors' names, and secondary citation.

18. PANDEX - CURRENT INDEX TO SCIENTIFIC & TECHNICAL LITERATURE.

PANDEX - Current Index to Scientific & Technical Literature provides a comprehensive data base from 2,100 scientific, technical and medical journals; 6,000 scientific technical books, 5,000 selected patents, and 50,000 U.S. Government technical reports annually. It covers all areas of pure and applied science, with coverage beginning in 1967. Each entry record contains manually indexed or manually edited thesaurus-generated subjects. *PANDEX* serves research requirements not satisfied by single disciplinary indexes but provides access to all literature of interest to a discipline as well.

The index generated by *PANDEX* from this data base is divided into two parts: (1) Subject-entries containing full title, primary author and periodical reference, arranged by all significant subject words and subarranged by all significant secondary words; (2) Author-entries containing all authors arranged alphabetically (primary author entries containing full title, all other authors, and the periodical reference) (secondary author entry containing name of primary author and periodical reference).

The magnetic tape files are prepared by CCM Information Corporation and issued weekly. The printed hard copy publication is issued bi-weekly.

19. Psychological Abstracts.

Psychological Abstracts, published by the American Psychological Association, Inc., Washington, D.C., is an important monthly bibliography listing new books and articles grouped by subjects, with a signed abstract of each item. The printed abstracts date from 1927. Currently, the data base tapes cover from 1967 through current issue.

Coverage includes approximately 600 journals.

20. Searchable Physics Information Notices (SPIN).

SPIN files, covering all areas of physics and astronomy research, are available dating from July 1970, from the American Institute of Physics. The monthly issued files constitute the machine-readable copy of the current input to the catalog of the *National Information System for Physics and Astronomy* (NISPA). An average of 2000-2500 document records per month are included. Currently 65 journals are reviewed by AIP, covering 40% of the world's journal literature on physics.

Data filed on *SPIN* tapes includes: article title, authors, affiliations; the journal title, volume date, and page number; the abstracts; keywords, subject classification numbers; and the bibliographic references to other

articles taken from the original papers. *SPIN* also contains the reel and frame number of the first page of each article published in full text in *Current Physics Microform* (CPM). Information centers subscribing to both *SPIN* and *CPM* can provide a current awareness alerting service for material chosen to meet individual interest profiles with the full text backup for AIP published journals from the CMP microfilm.

21. Sociological Abstracts.

Sociological Abstracts, published under the co-sponsorship of the Eastern Sociological Society and the Midwest Sociological Society, covers a broad range of sociological articles in periodicals in various languages. Frequency varies, but since 1964, the abstracts have been published 9 times a year. The printed abstracts date from 1952.

Currently, the data base tapes include Volumes 13, 14, and 15 (1963, 1964, and 1965). Tapes are being prepared for Volumes 11 and 12 (1961 and 1962) and later, Volumes 16, 17, and 18 (1966, 1967 and 1968) will be added.

22. TOXICON.

The new toxicology information system, entitled *TOXICON*, is an extensive collection of computerized toxicology information and data. It originates from the Toxicology Information Program of the National Library of Medicine.

TOXICON provides on-line literature searching and is designed to serve health professionals working in the areas of environmental pollution, industrial or occupational health and safety, pharmacology, toxicology, medicine, agriculture and other bioscientific disciplines.

The data base contains citations primarily, most including abstracts and/or indexing terms, full text state-of-the-art reports and toxicity data.

Among the data bases included in *TOXICON* are:

-*The Hayes File on Pesticides*

Includes more than 10,000 citations of reports on health aspects of pesticides with a limited number of index terms and abstracts. (EPA, 1940 to 1966)

-HAPAB (*Health Aspects of Pesticides Abstract Bulletin*)

Includes more than 8,000 abstracts of reports of the health aspects of pesticides in humans and animals; poisoning treatment, pesticide residue analysis and monitoring.
(EPA, 1966-current)

-HEEP (*Abstracts on Health Effects of Environmental Pollutants*)

A compilation of abstracts and citations of reports on effects of chemicals other than medicinals on humans and animals and on analytical methodology.

-CBAC (*Chemical-Biological Activities*)

A product of Chemical Abstracts Service; it contains more than 110,000 citations and CAS registry numbers.

23. TOXITAPES.

TOXITAPES, supplied by BioSciences Information Service (BIOSIS), consist of four (4) tapes, issued quarterly over a one-year period and covered items selected in large part but not exclusively from Biological Abstracts, Volume 51, No. 8, 1970 through Volume 52, No. 7, 1971.

The *TOXITAPES* were developed under a cooperative experimental program between the Toxicology Information Project of the National Library of Medicine and BIOSIS, Dow Chemical Co., and Eastman Kodak Co.

The *TOXITAPES* contain about 8000 documents and include bibliographic data and indexing assignments for toxicology literature, categorized as "Industrial" and "Pharmaceutical".

COMPUTER DATA BASES

1. AGRICULTURE
   a. CAIN
2. BIO-MEDICAL
   a. Biological Abstracts
   b. BioResearch Index
   c. MEDLINE/MEDLARS
   d. *TOXICON
      .Hayes File
      .HAPAB
      .HEEP
   e. TOXITAPES
3. CHEMISTRY
   a. *CA Condensates
   b. *Chemical Biological Activities
   c. Chemical Titles
4. EDUCATION
   a. ERIC
   b. .Current Index to Journals in Educ.
      .Research in Education
5. ENGINEERING
   a. CITE
   b. *Compendex
6. ENVIRONMENT
   a. *AMIC (Water quality)
   b. SWIRS (Solid Waste)
7. GEOLOGY
   a. Bibliography of North American Geology
   b. GEO.REF.
   c. Geophysical Abstracts
8. LIBRARY SCIENCE
   a. EPA Libraries' Holdings
   b. *MARC
9. MULTI-DISCIPLINE
   a. ISI Source Index
   b. PANDEX
10. PHYSICS
    a. Nuclear Science Abstracts
    b. SPIN
11. RESEARCH REPORTS
    a. *NTIS
12. SOCIAL SCIENCES
    a. Psychological Abstracts
    b. Sociological Abstracts

NOTE: *All or partially available On-Line.

APPENDIX B

This Appendix contains the price schedule based on present University of Georgia schedules. Lehigh University and Informatics charge $45 per terminal hour and a small extra charge for printing, handling, and mailing. MEDLINE services, both searching and off-line printing, ENVIRON, and AMIC are free at the present time.

GEORGIA INFORMATION DISSEMINATION CENTER PRICE LIST

July, 1972 - June, 1973

CURRENT AWARENESS SEARCHES

These searches keep the user up to date on the current literature. Current awareness searches are run whenever current issue or update tapes are received from the supplier. Search results are usually mailed within two days after receipt of the tape.

RETROSPECTIVE SEARCHES

These searches are scheduled over a two-week processing cycle. Turnaround time for retrospective batch searches from receipt of initial profile to delivery of final search results will normally run two to three weeks. Search results will be mailed throughout this period, however.

Special demand searches on frequency less than this two-week cycle will be accommodated only at higher special rates for which the requester assumes the entire cost of computer runs. Estimates for special searches are available on request.

SEARCH PROFILES

Information Specialists are available in the Center to construct the search profiles. There is no charge for this service. The question should be a fully descriptive paragraph describing the subject area to be searched and any qualifications, such as particular applications which are to be excluded. Suggested index terms or words frequently used and the names of authors who publish in the research area under consideration are especially helpful. Please include a telephone number at which the person requesting the search can be reached for additional information or clarification if necessary.

Changes to the profile will be made immediately upon receipt of a request by a user. The changes are not retroactive, however, for searches which have already been run. There is no charge for changes to the profile. The maximum number of terms which can be processed in one profile is approximately 200, depending on the length of the terms.

SEARCH RESULTS

The search result is a bibliography of retrieved documents. The output includes the title, authors' names, location of work (if available on the data base), primary document citation, and all index codes or index terms available on the data base.

Output on 8-1/2 x 11" one-part paper is the standard output. Output on 4 x 6" card stock is available for 2¢ per card in addition to the prices quoted for the standard output on paper. Abstracts will be printed for those data bases in which they occur for an additional charge of 10¢ per abstract.

SUBSCRIPTION INFORMATION

Searches are priced on a cost-recovery basis by the Georgia Information Dissemination Center. The prices are established on a per-profile per-search run basis. For current awareness searches the price is per-profile per-issue of the data base. For retrospective searches the prices are set on a per-profile per-volume searched basis. Each data base is searched separately, so that one profile searched against two data bases would be invoiced as the sum of the prices for the two files. Partially completed volumes within the current year are billed at the current awareness price (i.e., the issue price times the number of issues in the partial volume). Postage and shipping charges are billed extra for shipments outside the United States. Users requesting foreign delivery should specify the preferred method of shipment.

GIDC Price List, July 1972 - June 1973

Users are billed by itemized statement monthly. Searches may be entered or discontinued at any time without penalty.

Subscription discounts, where applicable, will be passed on by NERC-Cincinnati. In order to obtain the discount the organization must guarantee the minimum subscription. Unused balances are not refundable.

CURRENT AWARENESS SEARCHES

Data Base	Frequency of Updates	Price per Profile Per Issue
Biological Abstracts (BA)	semimonthly	$ 7
BioResearch Index (BIORI)	monthly	7
CA-Condensates (CA)*	weekly	7
CAIN	monthly	10
Compendex**	monthly	10
Current Index to Journals in Ed. (CIJE)**	quarterly	10
GEO.REF**	monthly	10
GRA (USGRDR)**	semimonthly	5
Nuclear Sci Absts.	semimonthly	5
Psychological Abstracts**	quarterly	10
Research in Ed. (RIE)**	quarterly	10
SPIN**	monthly	10

* Odd-numbered or even-numbered issues only may be specified.
** Abstracts available.

GIDC Price List, July, 1972 - June, 1973

RETROSPECTIVE SEARCHES

Data Base	No.Vols/Year	Price per Profile Per Volume
Biological Abstracts (BA) 1969 -	2	$ 40
Bibliography of North America** Geology 1961-1968	1	35
BIORI (BRI) 1969 -	1	80
CA-Condensates-Even Issues July 1968 (Vol. 69)	2	40
CA-Condensates-Odd Issues July 1968 (Vol. 69)	2	40
CAIN 1970 - The file prior to 1970 is treated as one volume	1	70
CBAC** 1965-1971	2	35
Chemical Titles 1962-1968	1	70
CIJE ** 1969 -	1	35
CITE E/E only 1968-1969	1	35
COMPENDEX ** 1969 -	1	100
Geophysical Abstracts ** 1966-1970	1	35
GEO.REF ** 1967 -	1	100
GRA (formerly USGRDR) ** 1970	1	70
NSA June 1966 -	1	70
Psychological Abstracts** 1967 -	1	35
RIE ** 1969 - The file prior to 1969 is treated as one volume	1	35
Sociological Abstracts ** 1965 - 1967	1	50
SPIN** June 1970 -	1	70

** Abstracts available

It should be noted, however, that NERC-Cincinnati will be testing and evaluating other services. Some information centers, government agencies, and other organizations may offer their services at reduced prices from time to time, for trial periods and special data bases. We will endeavor to investigate each and every situation to determine if changes in our present operations are warranted, or if some of these new services should be added. For example, a limited number of searches are available from BIOSIS whereby a search of their files containing 12 years of references, and their abstracts, are available for 20 cents a citation. This arrangement is limited, but if demand warrants, another contract may be negotiated.

APPENDIX C

SAMPLE PRINTOUTS

The following represent a typical printout that a user might receive:

All output that is larger than 8½ x 11 will be reduced to that the user need not worry about oversized papers.

Figure C-1 is an example from the University of Georgia.

Figure C-2 is a page from Lehigh University.

Figure C-3 represents a current awareness profile; and

Figure C-4 is a sample of three cards that were produced.

PROFILE # 019840-001 JUN. 02, 1972
ACCOUNT # THRESHOLD WT. 00000

DATA BASE SEARCHED: USGRDR V 72:01-09

GROUP	TERM NO.	TYPE	WEIGHT	TERM
G001	1	TXT	01000	WASTE WATER*
G001	2	TXT	01000	WASTEWATER*
G001	3	ESC	00000	452
G001	4	ESC	00000	187
G001	5	TXT	00000	SEWAGE*
G001	6	TXT	00000	SLUDGE*
G001	7	EIT	00000	SEWAGE ANALYSIS*
G001	8	EIT	00000	SEWAGE BACTERIOLOGY*
G001	9	EIT	00000	SEWAGE FILTERS*
G001	10	EIT	00000	SEWAGE PUMPING PLANTS*
G001	11	EIT	00000	SEWAGE PUMPS*
G001	12	EIT	00000	SEWAGE TREATMENT*
G001	13	EIT	00000	SEWAGE TREATMENT PLANTS*
G001	14	TXT	00000	EXCESS FLOW PLANT*
G001	15	TXT	00000	URBAN RUNOFF PLANT*
G001	16	TXT	00000	WASTE AND WATER
G001	17	TXT	00000	WATER AND WASTE
G002	18	EIT	00000	AUTOMATIC CONTROL*
G002	19	TXT	00002	AUTOMAT*
G002	20	TXT	00002	FEED-FORWARD*
G002	21	TXT	00002	INSTRUMENTATION
G002	22	TXT	00001	ANALOG PROCESS CONTROL*
G002	23	TXT	00001	DIGITAL PROCESS CONTROL*
G002	24	TXT	00002	INSTRUMENTED
G002	25	TXT	00001	COMPUTERIZED PROCESS CONTROL*
G002	26	ESC	00000	732
G002	27	ESC	00000	943
G002	28	ESC	00000	944
G002	29	TXT	00000	DETECTION AND CONTROL*
G002	30	TXT	00000	COMPUTERIZED CONTROL*
G002	31	TXT	00000	COMPUTER CONTROL*
G002	32	TXT	00000	COMPUTER AIDED CONTROL*
G003	33	EIT	00000	SEWAGE TREATMENT PLANTS,MODELS*
G003	34	EIT	00000	SEWAGE TREATMENT PLANTS,SIMULATORS*
G003	35	TXT	00000	SEWAGE TREATMENT PLANT MODEL*
G003	36	TXT	00000	SEWAGE TREATMENT PLANT SIMULATOR*
G004	37	TXT	00000	MINE
G004	38	TXT	00000	MINES
G004	39	TXT	00000	MINING

(G001&G002|G003)&¬G004

NUMBER OF ANSWERS 3

DOCUMENTS FROM THE LEADER RETRIEVAL SYSTEM

07/19/72

PAGE 1 OF 2: DOC 1 OF 30: LEADER DOC 72575.

TITLE CASE FOR CONTINUED STRONG SUPPORT OF BASIC RESEARCH BY THE FEDERAL GOVERNMENT
AUTH. ANON
JOUR. RES MANAGE V 13 N 4 P 273-9
DATE JULY 1970
SRCE. CMPDX7104 EI19544

PAGE 1 OF 2: DOC 2 OF 30: LEADER DOC 61679.

TITLE CASE FOR CONTINUED STRONG SUPPORT OF BASIC RESEARCH BY THE FEDERAL GOVERNMENT
AUTH. ANON
JOUR. RES MANAGE V 13 N 4 P 273-9
DATE JULY 1970
SRCE. CMPDX7104 EI19544

PAGE 1 OF 2: DOC 3 OF 30: LEADER DOC 100541.

TITLE INDUSTRY-GOVERNMENT COOPERATIVE RESEARCH FOR WATER POLLUTION CONTROL
AUTH. HARLIN JR CC
JOUR. AICHE WORKSHOP. IND PROCESS DES WATER POLLUT CONTR V 2. HOUSTON. TEX P 62-4
DATE APR 24-25 1969
SRCE. CMPDX7108 EI50855

PAGE 1 OF 2: DOC 4 OF 30: LEADER DOC 71966.

TITLE HOW RESEARCH IS HELPING TO SOLVE ASIAVS FOOD PROBLEMS
AUTH. MYERS WI
JOUR. RES MANAGE V 13 N 3 P 229-38
DATE MAY 1970
SRCE. CMPDX7104 EI19008

PAGE 1 OF 2: DOC 5 OF 30: LEADER DOC 61070.

TITLE HOW RESEARCH IS HELPING TO SOLVE ASIAVS FOOD PROBLEMS
AUTH. MYERS WI
JOUR. RES MANAGE V 13 N 3 P 229-38
DATE MAY 1970
SRCE. CMPDX7104 EI19008

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*                GOINERC0003
*                WJ BENOIT          DIR ADMIN          NAT ENV RCH CTR
**********THRESHOLD 0.750**********

      DISPLAY PROFILE  GOINERC0003

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    0.000  1  +REACT*
    0.750  2  +REPORT*        +PROGRESS
    0.750  2  +SYSTEM*        +REPORT*
    0.000  1  AIR*
    0.750  2  COMMUNICATIO    +SCIEN*
    0.750  2  COMMUNICATIO    +TECHNI*
    0.750  2  COMPUTER        LABORATORY
    0.000  1  DEFENSE
    0.000  1  ELECTRONIC
    0.750  2  FEEDBACK        +PROGRESS
    0.000  1  GENETIC*
    0.750  1  INFORMATION
    0.750  2  INTERIOR        +REPORT*
    0.750  2  MANAGEMENT      +FACILIT*
    0.750  2  MANAGEMENT      +PERSON*
    0.750  2  MANAGEMENT      +RESEARCH*
    0.750  2  MANAGEMENT      +SCIEN*
    0.750  2  MANAGEMENT      CONTRACTION
    0.750  2  MANAGEMENT      LABORATORY
    0.750  3  MANAGEMENT      PHYSICAL      PLANT
    0.000  1  SATELLITE
    0.750  2  STORAGE         RETRIEVAL
    0.000  0
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    MECHANIZED INFORMATION CENTER
    THE OHIO STATE UNIVERSITY LIBRARIES
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FINN KR, MILLER HB

IS YOUR MIS FIT FOR HUMAN CONSUMPTION? (INFORMATION).

INDUSTRIAL ENGINEERING
VOL. 3 1971 NO. 11 PAGE 18

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VOL.3 P.18
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BRITISH MEDICAL JOURNAL
VOL. 1 1972 NO. 5791 PAGE 54

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3-17-72

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VOL.1 P.54
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WHAT INFORMATION DOES MEDICINAL CHEMIST REALLY NEED? PROJECTIONS FOR FUTURE.

JOURNAL OF CHEMICAL DOCUMENTATION
VOL. 11 1971 NO. 3 PAGE 134

TERMS: INFORMATION

NERC00032062029
3-17-72

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SAMPLE: BI-WEEKLY PROFILE OUTPUT

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APPENDIX D

The following staff members at NERC-Cincinnati and their responsibilities can be used as a guide to the appropriate person to contact for help or advice:

MORTON H. FRIEDMAN	General services and new systems
DOTTIE F. BROFFT	General reference
LILIAN S. BOSWORTH	Record keeping, billing and distribution
MARY LEE BURBAGE	Central cataloging services
MARY L. CALKINS	On-line, biomedical and profile analysis
MAXINE M. SMITH	Batch, current awareness and profile analysis

Do not hesitate to contact any staff member whenever necessary. This system will work only so long as the librarians and researchers are willing to participate and make it work.

☆ U.S. GOVERNMENT PRINTING OFFICE 1972— 759-546/1013